

REMARKS

Claims 1-15 are pending in this application. By this Amendment, claims 1, 2, 4, 7-9, 13 and 15 are amended (1) for clarity, and (2) to correct informalities enumerated in the Office Action and discovered by Applicants on review of the Application and preparing this response. No new matter is added. Claims 1-5 are provisionally withdrawn from consideration as drawn to a non-elected group of claims. Reconsideration of the Application based on the above amendments and the following remarks is respectfully requested.

I. Restriction Requirement

The Office Action makes the Restriction Requirement final and indicates that rejoinder of withdrawn claims 1-5 will be considered upon allowance of claims 6-15. Applicants continue to believe that the Restriction Requirement is improper. It has been varyingly asserted that the elected apparatus of claim 6 may be made from a materially different process. This conclusion is incorrect. Elected claim 6 depends directly from independent claim 1. As such, elected claim 6 inherits all of the features recited in independent claim 1. Specifically, elected claim 6 recites a vibration-damped metallic article in which vibration is damped by the method according to claim 1. In this regard and based on its direct dependence on claim 1, it is unreasonable for the Office to assert that the metallic article, as claimed in claim 6, can be made by any materially different process. Further, independent method claim 1 recites features that substantially parallel allowable independent apparatus claim 7. As such, and under the provisions of MPEP §821.04, upon finding claim 7 allowable for the reasons indicated below, claim 1 and the claims depending therefrom, should be rejoined and allowed as well. Because claims 6-15 are allowable for the reasons discussed below, rejoinder and allowance of claims 1-5 are respectfully requested.

II. Allowable Subject Matter

The Office Action indicates that claims 8, 9, 14 and 15 recite allowable subject matter and would be allowable if rewritten in independent form including all of the features of the base claim and any intervening claims. Applicants appreciate this indication of allowability, but submit that all pending claims are allowable for the reasons discussed below.

III. §112, Second Paragraph Rejection of Claim 7

The Office Action rejects claim 7 under 35 U.S.C. §112, second paragraph. Claim 7 is amended responsive to the rejection. Thus, it is respectfully requested that the rejection be withdrawn.

IV. §103(a) Rejections of Claims 6, 7 and 10-13

The Office Action rejects claims 6, 7 and 10-13 under 35 U.S.C. §103(a) over Beele, U.S. Patent No. 6,127,048, in view of Cross et al. (Cross), U.S. Patent No. 3,758,233; and rejects claims 6, 7 and 10-13 under 35 U.S.C. §103(a) over Rickerby, U.S. Patent No. 6,218,019, in view of Cross. The rejections are respectfully traversed.

Beele, Rickerby and Cross, either individually or in combination, fail to disclose or suggest a predominant component of the outermost portion of the coating is metallic and is substantially free of non-metallic intrusions or cavities, as recited in claim 7.

Beele discloses an article of manufacture having a substrate 1, a bonding layer 4, an anchoring layer 3 disposed on a surface of the substrate 1, and a second oxide layer 2 (Fig. 1; Abstract). The second oxide layer 2 is alleged by the Office Action to correspond to the outermost portion of the coating recited in claim 7. However, the second oxide layer 2 is made from a columnar grained oxide ceramic, containing zirconia as a principal constituent and being formed essentially of a stabilized or partly stabilized zirconia (col. 3, lines 52-56; col. 6, lines 21-24). Applicants' disclosure, on page 3, final paragraph, explicitly defines "substantially free of non-metallic intrusions or cavities" as meaning that the volume ratio of

metallic component to the total of non-metallic components at the outermost (surface) portion of the coating is such that the metallic component greatly predominates and the metallic component has a generally continuous internal structure. Beele's second oxide layer 2 made from a columnar grained oxide ceramic, containing zirconia as a principal constituent is inconsistent with and contrary to, this definition and the recited feature in claim 7.

The Office Action asserts that "metallic" is considered to only denote the presence of metal, but does not necessarily mean being entirely composed of metal. Whether such assertion is true is irrelevant for a number of reasons.

First, Applicants' disclosure, on page 4, second paragraph, explicitly defines "metallic" (as applied to a material of the coating) as meaning that at least about 90% by weight of the material has the physical properties normally associated with metals. Again, Beele's second oxide layer 2 made from a columnar grained oxide ceramic, containing zirconia as a principal constituent is inconsistent and contrary to this definition.

Second, claim 7 recites that a predominant component of the outermost portion of the coating is metallic and is substantially free of non-metallic intrusions or cavities. Thus, the recited feature recites more than merely "denoting the presence of metal" as interpreted by the Office Action.

Third, as discussed above, Beele only discloses that the second oxide layer 2 is made from a ceramic material containing zirconia as a principal constituent. Thus, any metal in the second oxide layer 2 would be only trace amounts, contrary to a metal being a predominant component of the outermost portion of the coating as recited in claim 7. Therefore, the Office Action's assertion that "metallic" is considered to only denote the presence of metal, but does not necessarily mean being entirely composed of metal is irrelevant, as Beele fails to disclose or suggest a predominant component of the outermost portion of the coating is metallic and is substantially free of non-metallic intrusions or cavities.

Rickerby discloses a superalloy substrate 10, a bond coating 14, a thin oxide layer 16 and a columnar grain ceramic thermal barrier coating 18 (Fig. 1; col. 4, lines 31-43). The Office Action alleges that the columnar grain ceramic thermal barrier coating 18 corresponds to the outermost portion of the coating recited in claim 7. The Office Action again asserts the columnar grain ceramic thermal barrier coating 18 anticipates the outermost portion of the coating recited in claim 7 because that "metallic" is considered to only denote the presence of metal, but does not necessarily mean being entirely composed of metal. Because the Office Action applies Rickerby to reject claim 7 under the same rationale as Beele, for at least the same reasons discussed above Rickerby fails to disclose or suggest a predominant component of the outermost portion of the coating is metallic and is substantially free of non-metallic intrusions or cavities, as recited in claim 7.

The Office Action applies Cross to show the use of a titanium alloy as the substrate. Cross, however, fails to account for the deficiencies of Beele and Rickerby with respect to claim 7. Further, the Office Action has failed to indicate any substantive motivation for combining Cross with Beele or Rickerby. MPEP §2143.01(I). Rather, the Office Action asserts that it is obvious to add a ceramic and metallic coating to a titanium alloy simply because ceramic and metallic coatings are known (from Beele and Rickerby) and coating of alloy substrates are known (from Cross).

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. MPEP §2143.01(III). Further, a statement that modifications of the prior art to meet the claimed invention would have been within the ordinary skill of the art at the time the claimed invention was made because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima*

facie case of obviousness without some objective reason to combine the teachings of the references. MPEP §2143.01(IV). The Office Action failed to provide such objective reasons.

The Office Action must demonstrate that a person of ordinary skill in the art would obviously have arrived at the claimed subject matter based on the disclosures of Beele, Rickerby or Cross. Titanium is a relatively reactive metal and easily forms a passivating titanium dioxide film on its surface in the presence of air. The oxide film is porous to oxygen above approximately 400°C so that even at these relatively modest temperatures the passivating effect of the oxide film is lost. Oxygen attack is highly detrimental to the mechanical properties of the alloy substrate. Bearing in mind that many high specification uses to which titanium alloys are put, any mechanical failure or weakening is often extremely serious and potentially lethal. For this reason, apart from the natural requirement for smooth operation of the machine of which the alloy article forms a part, vibration damping is vitally important.

The combination of (i) high inherent reactivity of the underlying substrate, (ii) the presence of the oxide film, (iii) the uncontrollability of the oxide film, by virtue of its inherent ease of automatic formation, and (iv) the variability in the diffusion properties of the oxide film even at modest temperatures, causes substantial difficulties in devising effective vibration damping coatings for titanium alloys which must not be underestimated. These difficulties are magnified when the requirement that the coating must be highly resistant to foreign object damage and/or erosion is factored in, and magnified still further when the requirement that the damage resistant coating must substantially maintain or even enhance the vibration damping performance of the coating. Not only must adherence of the coating to the substrate and/or the oxide film be secure, but the integrity, stability and effectiveness of the coating must be reliable and effective, even as the chemical nature (e.g., reactivity) of the titanium metal and the oxide film may change underneath it. Moreover, all this must be

maintained very often in conditions of thermal cycling or at least thermal change, often within a wide temperature range.

As a result, it is often very difficult to predict with any certainty what the effect of applying a particular coating to a titanium alloy substrate will be. It is even less possible to predict that the claimed coating will successfully provide the advantages disclosed by Applicants' Specification. In essence, the sensitivity of the component materials to small variations as a result of the interaction, as well as the fine control of properties needed to provide a technically functional vibration damping coating for a titanium alloy substrate, mean that an expectation of success is generally unachievable in the absence of the above considerations. Not all coatings function as vibration damping coatings. Fewer are capable of functioning as vibration damping coatings for titanium alloy substrates in view of the tough operating parameters as indicated above.

Apart from the inherent unpredictability of the properties of coatings for titanium alloys, it is also counterintuitive that substantially removing non-metallic intrusions or cavities from a portion of a vibration damping coating would provide any advantage. This is because it is generally considered that vibrations should be damped better by the presence, rather than the absence, of energy absorbent regions within the bulk of the coating. On the other hand, Applicants determined a distinct advantage when non-metallic intrusions or cavities are avoided that is not recognized by the prior art.

The Office Action assumes that a coating is an inert surface structure which does not in any way interact with the underlying substrate. Although this may be true in some instances, it is not the case in the technical field of coatings on titanium alloy substrates. There is often extensive interaction between the coating and the substrate, and each can affect the properties of the other. Furthermore, the interaction can produce an interface between the coating and the substrate, which can itself influence the overall properties of the system.

In summary, the Office Action has failed to appreciate the inherent difficulties in selecting coating materials for effective vibration damping of titanium alloys. Coatings that may be effective on different metals can easily be completely ineffective when tried on titanium alloys. The Office Action incorrectly asserts that because a coating is known in the context of another metal, its use on a titanium alloy is obvious.

Therefore, in view of the above, none of Beele, Rickerby or Cross, either individually or in combination, discloses or can reasonably be considered to have suggested the combination of all of the features positively recited in claim 7. Because claims 10-13 incorporate the features of claim 7, these claims would not have been suggested by the combinations of Beele and Cross and Rickerby and Cross for at least their dependence on claim 7 as well as for the separately patentable subject matter that each of these claims recites. Claim 6 depends from withdrawn claim 1. Withdrawn claim 1 recites features similar to claim 7, as indicated above. Thus, claims 1-6 also would not have been suggested by any combination of the applied prior art references for at least the reasons indicated above with respect to claim 7 and the claims depending therefrom.

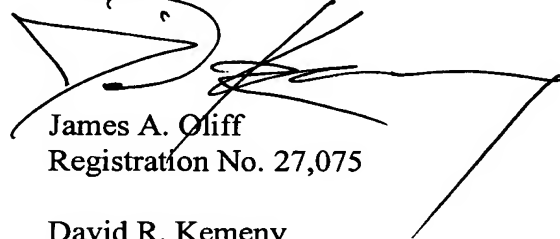
Accordingly, reconsideration and withdrawal of the rejections of claims 6, 7 and 10-13 under 35 U.S.C. §103(a) as being unpatentable over any combination of the applied prior art references are respectfully requested.

V. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-7 and 10-13, in addition to the indicated allowability of claims 8, 9, 14 and 15, are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



James A. Oliff
Registration No. 27,075

David R. Kemeny
Registration No. 57,241

ATTACHMENT:

Petition for One Month Extension of Time

JAO:DRK/smo

Date: September 6, 2006

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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